Hiroyuki AKIYAMA*: Rearrangement of two species of *Leucodon* (*Leucodontaceae, Musci*) with a note on *Felipponea*

秋山弘之*: イタチゴケ属二種の再検討と *Felipponea* 属の再評価

(Pl. X)

During my revisional studies on *Leucodon* and related genera, I encountered two species which had apparently been misplaced in *Leucodon*: *Leucodon esquirolii* Thér. and *L. lasioides* C. Müll. *Leucodon esquirolii* was originally described from China, and until now it has been reported from several localities (Akiyama 1984). It is transferred to *Felipponea* which is reevaluated in this paper. *Leucodon lasioides* has suffered from confusion in taxonomic treatment. It is transferred to *Forsstroemia* in this paper.

1) **Felipponea esquirolii** (Thér.) Akiyama, comb. nov. (Figs. 1, 3a; Pl. Xb–f).

Basionym: *Leucodon esquirolii* Thér., Monde Pl. Ser. 2, **9**: 22 (1907).

Leucodon latifolius Broth., Sitzungber. Ak. Wiss. Wien Math. Kl. Abt. 1, **133**: 572 (1924).=*Leucodon esquirolii* Thér. var. *latifolius* (Broth.) Zhang, Acta Bot. Bor.-Occ. Sinica **2**: 23 (1982).

Leucodon squarricuspis Broth. et Par., Rev. Bryol. **37**: 3 (1910).

Plants pale brown to shiny yellowish green in herbarium material, forming compact tufts. Ascending shoots julaceus and terete, (1–)2–3 cm long, 0.8–1.0 mm wide; central strand present. Flagella present. Axillary hairs of 4–5 cells, smooth; lower two cells quadrate, pale brown; upper two to three cells elongate. Pseudoparaphyllia few, lanceolate. Stem leaves appressed when dry, wide spreading when moist; 1.8–2.0 mm long, 1.0 mm wide, ovate, mucronate, not plicate, deeply concave; ecostate; margins plane, entire, often crenulate in young or small leaves; upper laminal cells long-rhomboidal, 27–46×5 μm, usually mammillose, thick-walled; median laminal cells short rhomboidal or fusiform, 14–22×5 μm, thick-walled; basal central cells linear, not or slightly porose, tinged with reddish brown. Alar regions only slightly differentiated.

Dioecious. Perichaetia on short branches; perichaetial leaves pale brown, elongating after fertilization, to 5–6 mm long, ecostate, involute; paraphyses

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* Department of Botany, Faculty of Science, Kyoto University, Kyoto 606. 京都大学 理学部植物学教室.

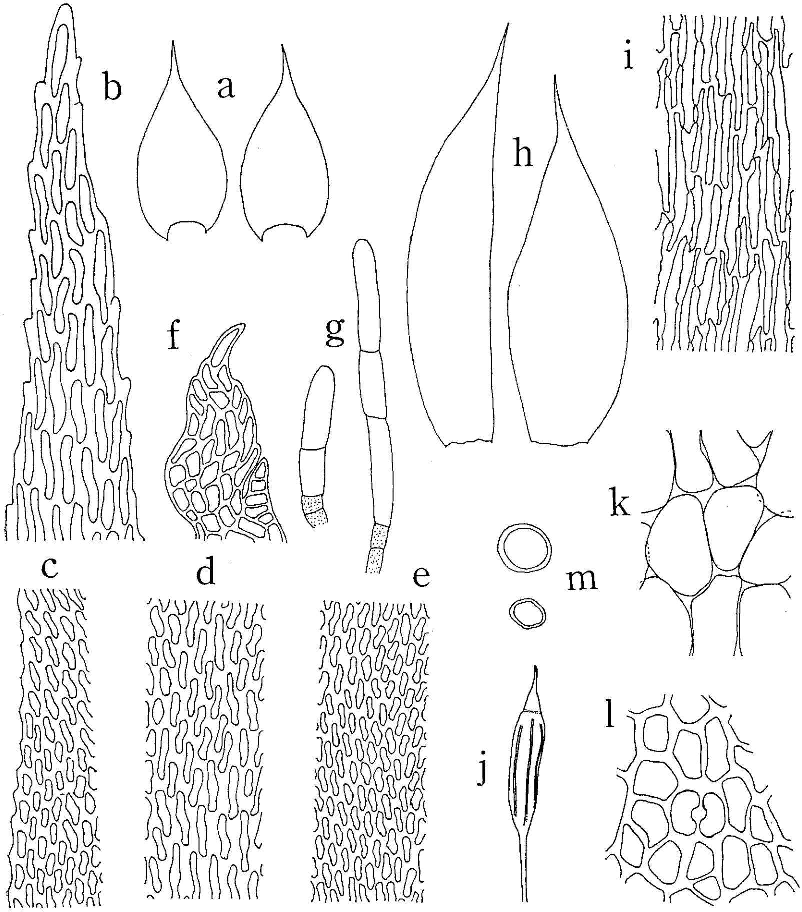

Fig. 1. *Felipponea esquirolii*. a. stem leaves, ×11; b. apex of stem leaf, ×260; c. upper marginal cells, ×260; d. upper laminal cells, ×260; e. median laminal cells, ×260; f. pseudoparaphyllia, ×260; g. axillary hairs, ×260; h. innermost perichaetial leaves, ×12; i. median laminal cells of perichaetial leaf, ×260; j. capsule, ×6; k. exothecial cells, ×260; l. stomata at apophysis, ×260; m. spores, ×260. Drawn from the isotype.

absent. Perigonial leaves pale brown, ovate, mucronate, to 0.6 mm long; paraphyses numerous. Setae 10-11 mm long, brown, helically coiled from lower right to upper left, smooth. Capsule reddish brown, 2.5×0.6 mm (with opercula), plicate when dry, symmetric or slightly asymmetric; stomata present at apophysis; exothecial cells hexagonal, thick-walled, verrucose. Opercula long rostrate, ca. 1.0 mm long. Annulus absent. Peristome double, white. Properistome absent. Exostome teeth 16, lanceolate, densely papillose (with stellate papillae), horizontally spreading outwards when moist. Endostome only of basal membrane, papillose, upright in any condition. Spores ca. 35 μm in diameter, minutely papillose.

Range: China and Japan.

Habitat: On tree trunks or rocks (including limestone).

Specimens examined: CHINA. Guizhou (Kouy Jcheou) Prov.: Janag-kia-chang, coll. Esquiroli 307—isotype of *L. esquirolii* (H). Jiangysu Prov.: Jan. 1922, coll. Yasuda s. n. (H); ditto., Aug. 1983, coll. Tokunaga s. n. (NICH). Kweitschou Prov.: coll. Handel-Mazzetti 2041 (H). Zhejiang (Chei tong) Prov.: 1908, coll. Majo s. n.—holotype of *L. squarricuspis* (H). Yunnan Prov.: coll. Handel-Mazzetti 211—holotype of *L. latifolius* (H). JAPAN. Kyushu. Fukuoka Pref.: Mt. Kawaradake, coll. Ochi 202 (NICH).

The diagnostic characters of this species are: i) the deeply concave and ecostate stem leaves without plication, ii) the poorly differentiated alar regions of stem leaves, iii) the long cylindric and deeply furrowed capsules with stomata at apophysis, iv) the long rostrate opercula, v) the horizontally spreading exostome in moist conditions, vi) the absence of properistome, and vii) the reduced endostome.

Brotherus (1924) described *Leucodon latifolius* on the basis of the entire uppermost margins of leaves, and compared it with *L. esquirolii* whose leaves were denticulate near apex. Noguchi (1968) reduced *L. latifolius* to a synonym of *L. esquirolii*, because he considered the denticulation was unstable and of no taxonomical value. On the other hand, Zhang (1982) considered the denticulation significant for the varietal rank and made a new combination, *L. esquirolii* var. *latifolius*. However, the denticulation near the leaf apex is variable even in a single shoot, and I agree with the Noguchi's (1968) treatment.

South American *Felipponea* Broth. is a small genus with *F. montevidensis* (C. Müll) Broth. and *F. hollermayeri* Thér. *Felipponea* is characterized by i) the julaceous, terete shoots in dry conditions, ii) the deeply concave and ecostat leaves without plication, iii) the weak differentiation between laminal cells and alar ones, iv) the upright, cylindric, and symmetric capsules, v) the horizontally spreading exostome teeth in moist conditions, and vi) the reduced endostome.

Sehnem (1970) reported the peristome of *F. montevidensis*; it closely resembles that of *Leucodon esquirolii*. *Felipponea montevidensis* differs from *F. esquirolii* only in the absence of the central strand in the stem and the shorter capsules which are not plicate in dry conditions. Therefore, I consider that *L. esquirolii* should be classified in *Felipponea*.

Manuel (1974) distinguished *Felipponea* from *Leucodon* mainly by the presence of the central strand in the stem. Although *Leucodon* and *Felipponea* are well characterized by several features, both genera include species without central strand in the stem as well as species with them. So the absence or presenec of the central strand in the stem cannot define the genera. On the other hand, *Felipponea* differs from *Leucodon* in the leaves without plication and in the characters of iii) and v) described above. I do not consider that these differences suggest they should be classified into different subfamilies as Manuel (1974) proposed.

Felipponea montevidensis has been reported only from South America (Brazil and Uruguay). Its range extends now to South Africa.

Felipponea montevidensis (C. Müll.) Broth., Contr. Fl. Bryol. Uruguay 2: 15 (1912).

Basionym: *Cladomnion montevidense* C. Müll., Hedwigia **36**: 108 (1897).

Range: South Africa (new), Brazil, and Uruguay (Fig. 3b).

Specimens examined: SOUTH AFRICA. Cape: coll. Breutel s. n. (NY, as *Leucodon capensis*); coll. M.R. & C.A. Crosby 9152 (TNS, as *Leucodon maritimus*). Natal: Mt. Kranskop, coll. R.K. Godfrey GH-1924a (NY, as *Leucodon assimilis*). Transvaal: Mt. Ship, coll. R.K. Godfrey GH-1690d (NY, as *Leucodon assimilis*); Mts. Kubberg, coll. C. Williams (NY, as *Leucodon assimilis*). Enon: collector unknown (NY, as *Leucodon capensis*). BRAZIL. Santa Catarina, coll. J.-P. Frahm 1693 (NY). Rio Grande do Sul, coll. S.J. Dialer s.n. (NY). URUGUAY. Sierra de Animas, coll. L.R. Landrum 3861 (NY). Catalan, coll. W.G. Herter 860 (NY).

As far as I could examine, all specimens which were collected in South Africa and determined as *Leucodon* are *Felipponea montevidensis*. As I could not locate and examine the type specimens of *Leucodon assimilis* and *L. capensis*, I do not know whether they are synonymous with *F. montevidensis* or not. For *L. maritimus*, Lin (1984) already transferred it to *Catagonium*. I agree with him.

2) **Forsstroemia lasioides** (C. Müll.) Nog., Misc. Bryol. Lichenol. **5**: 28 (1969), emend. Stark, Misc. Bryol. Lichenol. **9**: 181 (1983). (Fig. 2; Pl. Xa)

Basionym: *Leucodon lasioides* C. Müll., Nuovo Giorn. Bot. Ital. n. ser. **3**: 113 (1896).

Plants pale green. Stems of ascending shoots yellow to yellowish brown, to 6 cm long, slender, pinnately branching; central strands absent. Branches numerous, short, ca. 1 cm long; sometimes flagelliform at tips. Stem leaves 1.3–1.7 mm long, 0.6 mm wide, ovate, cuspidate, not plicate; alar regions well-differentiated and decurrent to the stems; margins entire, recurved in lower parts; costae very short and forked; median laminal cells thick-walled, 43–54× 4–5 μm; basal central cells not or weakly colored and not porose; alar cells thin-walled, quadrate. Pseudoparaphyllia numerous, linear lanceolate to triangular, 1–3 cells wide at bases. Axially hairs 5–6 cells high, smooth; basal 1(-2) cells minute, quadrate and yellow, upper 3–4 cells oblong, colorless.

Range: China.

Habitat: Unknown.

Specimens examined: CHINA. Shensi Prov.: Jn-kia-po, coll. Giraldi 6568 (H); Si-ku-tzui-san, July 1894, coll. Giraldi s. n.—lectotype of *Leucodon lasioides* (H).

Noguchi (1969) studied a specimen which was determined as *Leucodon lasioides* by Müller himself and found that this plant should be included in *Forsstroemia*; he made a new combination, *F. lasioides* (C. Müll.) Nog. Stark (1983) recovered an isotype specimen of *Leucodon lasioides* kept in Helsinki,

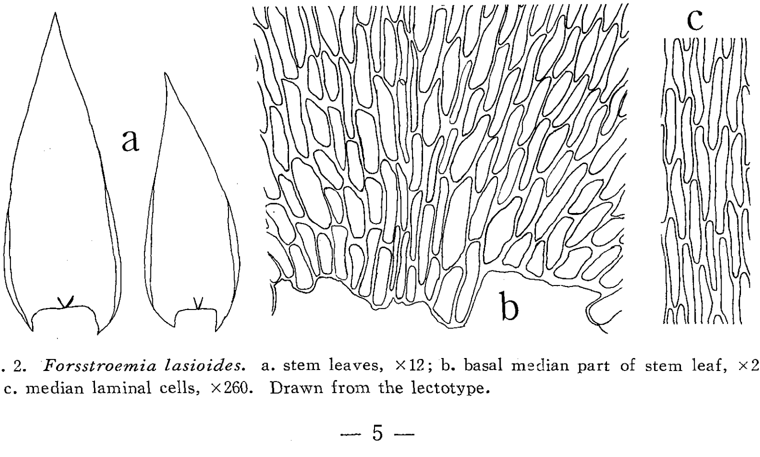

Fig. 2. *Forsstroemia lasioides*. a. stem leaves, ×12; b. basal median part of stem leaf, ×260; c. median laminal cells, ×260. Drawn from the lectotype.

and selected it as the lectotype. He studied the lectotype and the specimen which Noguchi studied as a supposed authentic specimen of *L. lasioides*, and found that they were of different identities. He subsequently discarded Noguchi's (1969) combination and gave a new name, *Forsstroemia noguchii* Stark, to the plant that Noguchi (1969) had thought to be *L. lasioides*.

According to Stark (1983), *Leucodon lasioides* is diagnosed by the following characters: i) the absence of pseudoparaphyllia; ii) the absence of the central strand in the stem; iii) the ecostate stem leaves; iv) the yellow leaf insertion; v) the lack of flagelliform branches; and vi) the numerous antheridial paraphyses. These features, he considered, do not agree with the diagnoses of *Forsstroemia* which he presented. Therefore, he left this species in *Leucodon*.

I also had a chance to examine the lectotype of *Leucodon lasioides*, and found some features which were inconsistent with Stark's (1983) observations. According to my observation, the lectotype has characters as follows: i) the pseudoparaphyllia are present; ii) the short but distinct forked costae are present; iii) the central strand in the stem is absent; iv) many branches occur even in the lower part of ascending shoots and the tips are often flagelliform; v) the stems are pale to deep yellow or orange (red to reddish brown in *Leucodon*); vi) stem leaves are distinctly decurrent at base. As pseudoparaphyllia are known in both genera, their presence cannot be used as a distinguishing character (Akiyama 1986). The other characters agree well with the Stark's diagnoses of *Forsstroemia*. Therefore, I consider that *Leucodon lasioides*

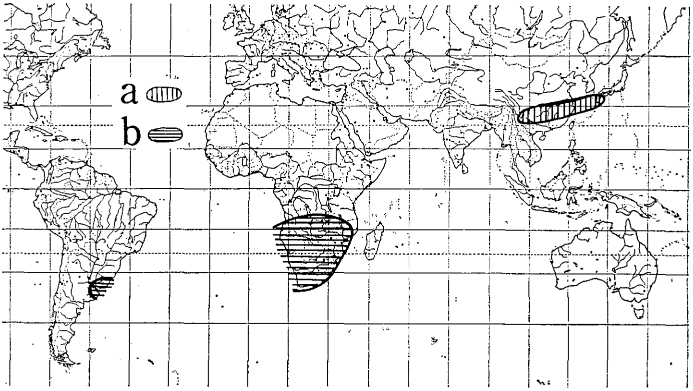

Fig. 3. Distribution of two species of *Felipponea*. a: *F. esquirolii*; b: *F. montevidensis*.

should be removed from *Leucodon* and included in *Forsstroemia.* This rearrangement does not cause a modification of the concept of *Forsstroemia* presented by Stark (1983, 1987).

Forsstroemia lasioides closely resembles *F. noguchii* Stark known from the calcareous areas in China and Japan. *Forsstroemia lasioides* differs from *F. noguchii* only in the very short costae (reaching only 1/10 of the leaf length), and might be conspecific. Both species need to be reexamined after more specimens are available.

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Explanation of plate X

a. lectotype specimen of *Leucodon lasioides*, Giraldi s. n.; b. isotype of *Leucodon esquirolii*, Esquiroli 307; c–f. peristome of *Felipponea esquirolii*, Esquiroli 307; c. whole view, ×100; d. endostome, ×340; e. basal part of outer surface of exostome, ×340; f. upper part of outer surface of exostome, ×680.

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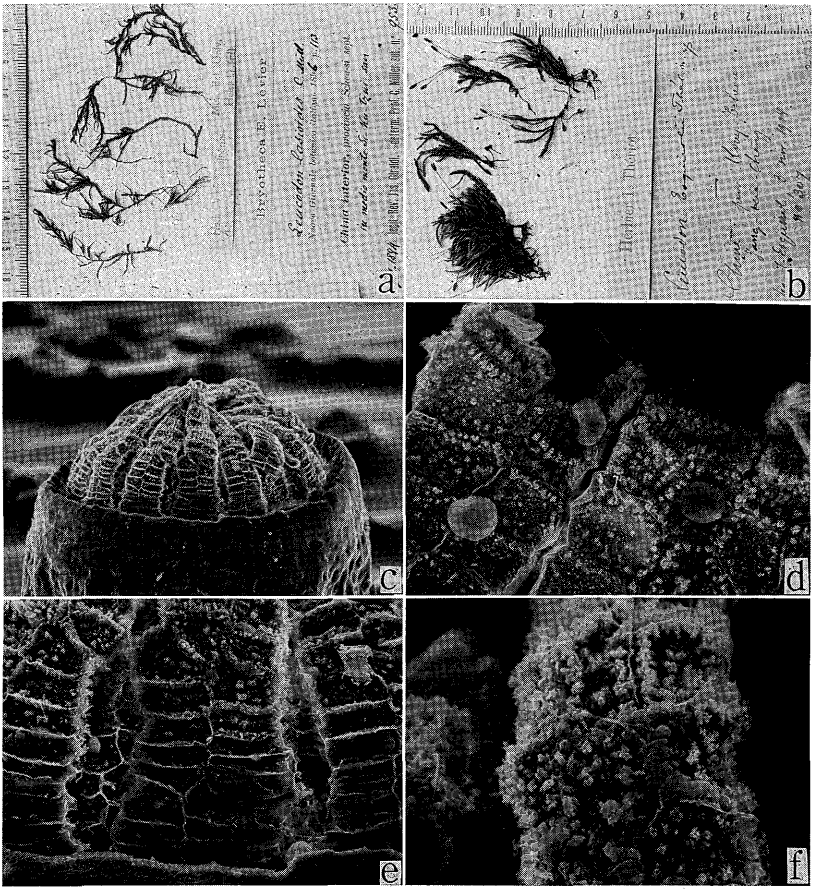
従来イタチゴケ属とされてきた二種について再検討を行った。中国および日本に産する *Leucodon esquirolii* (シワナシチビイタチゴケ) は，乾いたときに茎に圧着する葉をもち，その葉は翼部とそれ以外の部分での細胞の大きさ，形に大きな差がない，などの点においてこれまで南米のみから知られていた *Felipponea* 属に所属されるべきものである。本種は第三番目の種となるが，他の二種とはその分布域が非常にかけはなれている。一方中国から報告されていた *Leucodon lasioides* は野口 (1969) によってスズゴケ属に移されたが，これは誤解にもとづくものであるとして Stark (1983) は本種をイタチゴケ属にもどした。筆者は Stark によって再発見された type 標本を借りうけ検討したところ，今度は Stark の観察に誤りがあることを発見した。つまり *Leucodon lasioides* は枝先がときに鞭状に伸び，葉の基部には短いが明瞭な二叉する中肋を持ち，葉縁基部は茎に長く流下する。これらは Stark 自身がスズゴケ属の特徴としてとりあげたものによく一致する。以上の結果，シワナシチビイタチゴケに対しては新組換え *Felipponea esquirolii* (Thér.) Akiyama を，また *Leucodon lasioides* については，野口の組換え *Forsstroemia lasioides* (C. Müll.) Nog. を採用する。

□佐竹義輔ほか：**野草の本** 144 pp. 1987. 財団法人サンワみどり基金，東京．「四季の野に遊ぶためのカラーガイド」の副題がついた初心者向きの手引書。帰化植物なども含めた身近な野草約610種を取り上げ，全種のカラー写真と若干の説明線画，そして簡単な解説からできている。B6判へ詰め込んで写真は小さいが，印刷がよいので細部までよくわかる。配列はまず春・夏・秋～冬の3部に分け，次に市街地・郊外・野山・海辺の4つに，さらにその生育環境を11区分して「タンポポの咲く風景」「ススキのある風景」などと名付け，植物を見つけやすい。編集・執筆・写真などには多数の専門家や教育者が参画していて確かな内容である。書店にはなく，上記の財団へ送料280円を添えて申し込めばプレゼントしてくれることになっている。1人1冊，手紙による申し込みに限る。宛先は〒100 東京都千代田区大手町 1-1-1 三和銀行東京ビル3階 サンワみどり基金。 (伊藤 洋)



AKIYAMA: Two species of *Leucodon* (See p. 272)